Office of Technical Assistance Research Proposal

Chromium Substitutes for Leather Tanning and Finishing Operations

Background:

There are approximately 110 leather tanning facilities in the United States. They generally fall into Standard Industrial Classification 3111. The industry has suffered dramatic setbacks over the last quarter century, both nationally and in Massachusetts. The industry in Massachusetts is still a sizeable contributor to the overall U.S. market. There are approximately 12 such facilities remaining in Massachusetts.

Scope of Problem:

Current leather tanning and finishing operations involves the use of many chemicals. Chromium and chromium compounds are some of these chemicals. They are used in various process steps throughout a leather facility. Simply stated, leather tanning is the preservation of hides or skins by the use of a chemical which makes them immune to bacterial attack, raises the shrinkage temperature and prevents the collagen fibers present in the product from sticking together on drying, so that the material remains porous, soft, and flexible. In chrome tanning, which accounts for approximately 90% of U.S. tanning production, chromium ammonium sulfate is used as the tanning agent. Chromium phosphate sulfate may also be used in the tanning process. The reaction in the process is of a coordination nature between the carboxyl groups of the skin collagen and the metal (chromium) atom. This reaction must take place under a controlled pH (~3) to be effective. Also used are various chrome pigments used in the dyeing phases of the process; these may be chrome green, chrome yellow and chrome red, as they are commercially known. There are also miscellaneous pigments such as molybdate orange and zinc yellow based on lead and zinc compounds of chromium. The leather industry personnel spoken with indicate that the chrome pigments produce a color, which either cannot be duplicated in shade or intensity by other alternatives or for which there are no alternatives. Also of concern are fugitive air emissions from chromium dust in several of the operations and as residues in containers disposed of either on-site or off-site. These chemicals are harmful environmentally as well as to worker health. Chromium compounds used in tanning operations are TURA reportable. The last data reported indicates that greater than 686,000 pounds of chromium or chromium compounds are used by these companies for this purpose.

Objectives:

There are obviously several areas where research could be conducted to find viable alternatives regarding this issue. One could be for a substitute for the use of trivalent chromium salt, usually a basic chromium sulfate, in the tanning or retanning process. Another is for the use of chromium containing dyes and pigments used in the coloring step. A solution in any area would be beneficial. There are several companies that are felt to be likely candidates as industry partners in this area.

Benefit:

The reduction of the risk associated with the elimination of these chemicals would benefit the workers, the environment and improve the public image of these operations. In addition, the reduction of fees associated with the regulatory reporting could help maintain the competitiveness of the companies in Massachusetts in this industry sector, especially with foreign markets. It could also have positive benefit for the industry on a national scale as well.